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ROYAL BOTANIC GARDENS, KEW

XXVI.—GOSSYPIUM. Sir George Watt.

The following observations may be described as constituting a Classified Enumeration, with brief diagnostic descriptions, of certain species of cultivated and wild cottons, specimens of which are preserved in the Herbaria of the Royal Botanic Gardens of Kew and Edinburgh.

The genus *Gossypium* may be said to have been neglected botanically, as a consequence, very possibly, of its great popularity in modern commerce, or in consequence of the opinion, at one time entertained, that all the cottons of the world constituted but one (or a very few) species. Moreover, cotton is only recently a cultivated plant, comparatively speaking, in the chief areas of its production. While that is so, there are several species that exist both wild and cultivated, and others that have never been cultivated at all, yet both sets have been entirely overlooked by botanists. It naturally follows that there are several cultivated forms more or less misunderstood because of imperfect knowledge regarding their origin.

Nothing has surprised the writer more than the importance of the Continent of Africa in a study of the genus. The present notes are accordingly intended very largely as a contribution toward a better understanding of certain African, Egyptian, and Indian cottons. They will be found to amend and amplify, and in some instances correct, the particulars given in the "Wild and Cultivated Cotton Plants of the World."

With very few cultivated plants has hybridism played a more important part than with the cottons. But whether produced by hybridisation or selection, improved stocks, directly adapted to locality or requirement, are the foremost consideration in extended or improved production. The first step in that direction is accurate knowledge of both the wild and the cultivated forms. Without that knowledge the attempted acclimatisation of foreign stocks may only retard progression.

The prevalence of hybrids greatly obscures the study of the species of *Gossypium*. In fact the value of certain characteristics may at first sight appear questionable. For example, the shape of the leaf and the degree of its segmentation ; the presence or absence of glands on the veins; the shape, cohesion and serration of the bracteoles; and the presence or absence of a fuzz on the seed, are all features which, taken individually, might be regarded as negligible, and yet certain combinations of them can be accepted

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as diagnostic of species, varieties or races. Then again a field of cotton very rarely consists of an absolutely pure stock. A plant picked up here may have no glands on the veins of the leaves, while there another may have several. Two or more forms may be grown mixed together either through ignorance, or indifference, or from the belief that the one is helpful to the other. But the one may be a splitting hybrid that manifests certain features not visible in the other—the pure dominant. That is the story of the so-called "Hindi Weed" of Egypt, which in certain of its forms throws back to *G. punctatum*, in others to *G. peruvianum*. Lastly it is probably safe to affirm that few cultivated plants are more dependent on environment than are the species and hybrids of *Gossypium*.

[The references cited below are to Watt's Wild and Cultivated Cotton Plants of the World.]

SECTION I. SPECIES WITH FUZZ BUT NO FLOSS: BRACTEOLES FREE.

G. Darwinii *Watt*, l.c. p. 68, plate 4.

GALAPAGOS. Albemarle, *C. Crossland in Riley, 440*, dated 3–8–24.

The fruits and seeds of this species are unknown to me, so that its presence in this section is open to question. I would repeat (l.c. p. 69) that at the time at which this species was collected by Darwin, cotton could hardly have been cultivated anywhere on the Galapagos Islands. *G. Darwinii* may accordingly be the survival of an ancient form that may at one time have had a wide distribution on the mainland of America. And it is interesting to add that its pollen grains approximate in size and shape closely to those of *G. vitifolium* and *G. barbadense*.

G. Stocksii *Mast.*; Watt, l.c. p. 73, plate 6.

INDIA, Sind. A wild species never cultivated: has taken no part in the production of the cottons of India.

SECTION II. SPECIES WITH BOTH FUZZ AND FLOSS: BRACTEOLES UNITED.

* *Leaves ⅔rds palmately (sometimes almost pedately) 3–7 lobed: lobes curvilinear, bristle-tipped: base distinctly cordate: and central vein only bearing a gland.*

G. arboreum *Linn.*; Watt, l.c. pp. 77, 81–91, plates 7 and 8.

Leaves broad, ovate-cordate, acute, thick, glabrescent, ⅔rds palmately 3–7 lobed; lobes curvilinear, bristle-tipped, sinuses between the lobes open and often carrying extra teeth within. *Bracteoles* ovate, acute, entire or toothed on the apex. *Flowers* purple with darker coloured claws. *Calyx* truncate or only slightly 5-angled and prominently gland-dotted. *Corolla* nearly three times the length of the bracteoles. *Seeds* with a greenish coloured fuzz, in the purer forms.

In *G. arboreum* the tendency of the bracteoles to become toothed may be accepted as a manifestation of hybridism.

TROPICAL AFRICA. *Mr. and Mrs. Broun's 1641* (1909), cultivated in the Sudan (bracteoles coarsely toothed); *A. F. Broun* (said to be *Mr. Lawrence Balls' 213–1*), Sennar Cotton; *T. Thornton* (Dec. 1913), from Ilorin Aguji, Northern Nigeria—typical; *P. H. Lamb, 3*, Ilorin, Northern Nigeria (Nov. 1912), said to be perennial tree cotton; *Imp. Inst.*, Matanka Nawa, N. Nigeria (Feb. 1913); *E. W. Foster, 188*, Obba, South Nigeria, Tree Cotton; *Imp. Inst. 48,487*, Gambaga, N. Territories, Gold Coast.

EGYPT. A typical example seen in the Herbarium of Egyptian Cottons, Min. of Agri., *N. D. Simpson, C. 66*, grown at Giza from seed procured from the U. P. of India. It is somewhat remarkable that there are no recent samples of plants grown from Egyptian or African seed. The species seems more abundant on the West than the East side of Africa.

SIAM AND THE EAST. *A. F. G. Kerr, 4418* (Aug. 1920), from Siam, said to be "Cultivated as an ornamental shrub"; *A. Marcan, 450* (7 Oct. 1920) Temple of Bangkok, Siam; Flora of Singapore, etc.

VAR. **sanguineum** *Watt*, l.c. pp. 77, 91–95, plate 9.

Leaves broader than in the type, the lobes broader, thinner and more hairy, often not constricted below and frequently of a purple tint. *Bracteoles* very much larger and more deeply gashed. *Flowers* purple with darker patches on the claws.

This is the purple-flowered annual or biennial field crop. It is frequently hybridised with *G. Nanking* or *G. neglectum*, when the flowers become small and often pink or white.

TROPICAL AFRICA. This is sometimes spoken of as a specially African form and yet there are no examples of it in recent Tropical African collections.

EGYPT. The Cotton Herb. Min. of Agri. Egypt, *N. D. Simpson, C. 93* (seed procured from the Panjab): Also the following hybrid forms (*sanguineum* × *Nanking*), *C. 78* (flowers pink with purple claws): *C. 92* and *C. 94* (seed procured from the Panjab).

INDIA. Karnal District, Panjab, *J. R. Drummond, 22,065*; South India, *Sir A. G. and Lady Bourne, 2817* (said to be *G. obtusifolium* Roxb., var. *Nanking* Gammie); also South India, *Viscount Gough* (said to be *G. nigrum*).

VAR. **neglectum** *Watt* l.c. pp. 77, 95–108, plates 10, 11 and 12. Bengal or Dacca Cotton.

Leaves very hairy, coarse, bullated, rough furrowed or corrugated; lobes 3, 5 or 7, often with supplementary teeth, linear-lanceolate, undulate, the bottom pair spreading. *Bracteoles* very large, greatly produced laterally, more than half the length of the corolla. *Flowers* often two together, usually yellow with purple claws.

In hybrid states the flower tends to become white or pink with purple claws.

JAPAN. A series of six sheets (Nos. 8, 9, 13, 14, 15, and 16) are correctly named as variety *neglectum*. These were raised at the Experimental Station of Mokpo, Chosen, from seed procured from Southern China, *S. Mihara*. The specimens are beautifully preserved but unfortunately each shows but two leaves and a flower and neither bracteoles, calyx, fruit nor seed, so that they cannot be critically discussed. As a series they are most interesting. They have lost the roughness of the Indian plant and become glabrescent, and the flowers of Nos. 13, 14, and 16 are pink or white, while the plants do not appear to be hybrids.

EGYPT. The following were grown at the Experimental station of El Giza, Cairo: *N. D. Simpson*, *C. 64*, *C. 76* and *C. 273*, all raised from seed obtained from India. They may be said to have the foliage as in *G. arboreum* but flowers yellow with purple claws and much larger than is customary: *C. 275*, flowers yellow but unusually small. The following appear to be hybrids of var. *neglectum* × var. *roseum*, *C. 63*, *C. 65*, *C. 70*, and *C. 78*: while *C. 91* is possibly a cross of var. *neglectum* × *G. Nanking*. In all these hybrids the flowers are smaller and contained within the bracteoles and white or pink with purple claws.

** *Leaves half cut into* 3–5 (*mostly* 3) *lobes, the extra pair appearing as if artificially attached, thus abnormally increasing the breadth: the lobes deltoid-oblong, acute or acuminate: base usually only slightly cordate: very frequently* 3 *veins bear glands below.*

G. Nanking *Meyen*; Watt, l.c. pp. 78, 114–124, plate 15.

Leaves broad, ovate, tending to cordate, acuminate, softly though sparsely hairy (often stellately), one-half cut into 3–5 (mostly 3) lobes, with the lobes arching upwards, deltoid-oblong, acute, acuminate, sinuses (in hybrid states) having supplementary teeth. *Bracteoles* ovate, oblong, deeply cordate, large, generally half the length of the corolla, 3–4 teeth on the apex. *Flowers* frequently large and not fully expanding, yellow or purple or white, with faint purple claws, the whole corolla turning purple with age. *Calyx* wide, loose, truncate. *Capsules* angled, ovate, acuminate, 3–4-celled. *Seeds* large, irregular, densely coated with rufous fuzz and carrying a good silky floss which shows a tendency to become khaki (red) coloured.

I employ the name *G. Nanking* Meyen (Reise, II, 1836, p. 323) in preference to *G. indicum* Lamk. (Encycl. 1786) in order to avoid the error originated by Plukenet (Alm. Bot., 1696) and continued by Lamarck, Cavanilles, Willdenow, De Candolle, etc. Moreover the name *indicum* is open to ambiguity since the plant is more Chinese than Indian.

There are many varieties and cultivated races of this plant, of which the following may be specially mentioned:—

Gossypium Nanking *Meyen*, var. **japanense** *Watt*, var. nov.

Folia magna, lata, tenuia, laevia, glabra vel glabrescentia; lobi deltoidei, acuminati, iis var. *himalayani* similes sed majores,

sinibus in plicas elevatis sed sine dentibus supplementariis. *Bracteolae* accrescentes, maximae, ovato-triangulares, acutae, dentibus 3–4 brevibus apicalibus. *Petala* flava vel alba, unguibus saepius purpureis.

JAPAN. Cultivated at the Cotton Experimental Station, Mokpo, Chosen, Japan, from Chosen seed, *S. Mihara, 10* (type).

Leaves large, broad, glabrous or glabrescent, thin, smooth; lobes deltoid, acuminate, very similar to though larger than those in var. *himalayanum* and with the sinuses thrown up in folds but apparently never furnished with supplementary teeth. *Bracteoles* becoming accrescent, very large, ovate, almost triangular, acute, and with 3–4 short teeth on the apex. *Flowers*, in a recent collection from Japan the following occur:—Nos. 2, 5, 10 and 12 the flowers are large yellow with purple claws: No. 1 not quite so large, and yellow but without purple claws: No. 3 white with purple claws but so small as to be hidden within the bracteoles: No. 6 large, pale, tinted with purple and having deep purple claws: No. 11 large, white, blotched with purple and with darker coloured claws: No. 4 flowers small, pure white.

The plant indicated may be accepted as typical of the chief cottons of China and Japan. On the labels of the above-mentioned Japanese specimens it is stated that the seed had been obtained, 10 and 11 from Japan, all others from China, and all were grown at the Experimental Station of Mokpo, Chosen.

In The Wild and Cultivated Cotton Plants of the World (pp. 123–4) I have described several Japanese and Korean cottons that differ only very slightly from the above. Plate 15, f. E. shows a portion of one of these, grown at Washington, U.S.A. An excellent specimen will be found in the Edinburgh Herbarium, supplied by the Yokohama Nursery Company Ltd., and named *G. herbaceum* Linn., also an earlier specimen collected by W. R. Carles on the West Hills of Peking, and still another, by the same collector, from Shanghai. The last mentioned comes remarkably near the Indian variety *himalayanum*.

VAR. **Bani** *Watt*, l.c. pp. 131–4.

The Berar, Hinganghat or Oomra Cottons of India.

Twigs, petioles and peduncles pilose and usually purple coloured. *Leaves* large, thin, softly pilose; lobes undulate. *Bracteoles* large, thin, membranaceous, ovate, triangular to oblong-acute, with three teeth on the apex, the central one much the largest and each bracteole having three veins usually prominent along the centre. *Flowers* much smaller than in varieties *himalayanum*, *japanense* or *Nadam*, not much exceeding the bracteoles and yellow, pink or white, usually with purple claws, vividly recalling the flowers of *G. arboreum* var. *neglectum*; the tendency to white or pink flowers would appear to be more common in China and Japan than in India.

An extensive series of samples, deposited in the Edinburgh

Herbarium, has been received from the Cotton Herbarium of the Ministry of Agriculture in Egypt, procured from plants cultivated at the Experimental Station of El Giza, near Cairo, and prepared by Mr. N. D. Simpson. The plants were raised from seed procured from India. They may be here indicated since they are instructive. They are better botanical specimens than are to be found in most herbaria and are fully illustrative of "Berar," "Hinganghat" or "Oomra" (Amraoti) cottons of Indian Commerce.

The following enumeration may be accepted as indicating these Egyptian grown *Bani* Cottons:—

C. 68. Seed procured from Bombay: approaches var. *Nadam*.
C. 69. Seed from Bombay under the name *Cutchica*: flowers small white with pink claws, probably a hybrid, *Nanking* × *neglectum*.
C. 71. Seed from the Central Provinces: plant glabrescent, a form approaching var. *Nadam*.
C. 75. Seed from the U.P.: suggestive of var. *Nadam*.
C. 80. Seed from the Panjab: flowers small pinkish-white, bracteoles large with 5–6 teeth; approaches var. *neglectum*.
C. 83. Seed from Madras under the name *Caragani II*: young leaves velvety.
C. 84. Seed from Madras: is var. *Bani* race *Mathio*: matches exactly Gammie's pl. No. 1, which he names *G. obtusifolium* Roxb.: flowers small, yellow with purple claws: bracteoles with 6–7 minute teeth: twigs, etc., glabrescent and purple coloured.
C. 272. Seed from the Panjab under the name *G. indicum*, flowers yellow.

Gossypium Nanking *Meyen*, var. **canescens** *Watt*, var. nov. *Ramuli*, petioli pedunculique molliter pilosi. *Folia* 3–5-loba, tomento brevi griseo canescentia, tandem glabrescentia, lobis acutis apice setiferis deorsum leviter constrictis. *Bracteolae* magnae, ovatae, acutae, membranaceae, saepius tridentatae; glandulae interiores triangulares, glandulis epidermidis punctiformibus parvis brunneis circumscriptae. *Calyx* dentibus 5 minutis acutis. *Petala* verosimiliter purpurea. *Lana* seminum facile detergibilis, sericea, nivea.

Anglo-Egyptian Sudan. Nyonki, *Shantz, 933* (type).

Twigs, petioles and peduncles softly pilose. *Leaves* canescent, coated with a short grey tomentum, and in time becoming glabrescent: 3–5 lobed, the lobes slightly constricted downwards and apex acute, bristle tipped. *Bracteoles* large, ovate, acute, membranaceous, mostly tridentate; *glands* within triangular, outlined by small brown epidermal gland-dots. *Flowers* apparently purple coloured. *Calyx* with five minute, acute teeth. *Floss* readily separable from the seeds, pure white silky.

Tropical Africa. The form here indicated was collected by *H. L. Shantz*, at Regu (*912*) and at Nyonki (*933*), in the Anglo-

Egyptian Sudan, July 1920; by *H. Powell*, *6* and *14* ("Native seed cotton"), at Gosha, Jubaland, British East Africa; by *Aug. Chevalier*, *11062*, French Tropical Africa.

An African plant closely allied to the Indian *Bani* cottons and isolated more on account of geographical than botanical considerations. It would seem possible, in fact, that it may prove the wild condition of the cultivated *Bani* cottons. But in some of its forms the African plant manifests an approach to *G. arboreum* Linn. var. *sanguineum*.

VAR. **Nadam** *Watt*, l.c. pp. 78, 128–31.

Leaves 3–5–7-lobed, thick, leathery, glabrescent; lobes subtriangular, often with supplementary teeth. *Bracteoles* small, thick, sparsely toothed. *Flowers* large, bright yellow with purple claws.

In India this is known as Coconada Cotton and may be viewed as parallel with var. *neglectum* in the *G. arboreum* series. But it does not appear to be met with in Africa, its place being there taken by the two species *G. Simpsonii* and *G. soudanense*. In Egypt, recently introduced stocks of *Nadam* have been experimentally cultivated, of which mention may be made of *C. 54*, the seed of which had been supplied by Madras under the name of *Karaganni III*, and from Madras also came *C. 82*.

Mention may be here made of two specimens preserved in the Kew Herbarium that would appear to be forms of variety *Bani*, namely, that collected by *Mr. George Forrest*, *15,635* in Yunnan, and by *M. le Dr. Thorel* in Cochin-China, (*Herb. Mus. Paris*). In certain respects these approximate more closely to the African wild plant for which I have ventured to assign the distinctive name *canescens*. So again in the Edinburgh Herbarium there is preserved, what is said to be a duplicate of *Forrest*, *15,635*, but which I take to be a plant closer to variety *Nadam* than to *Bani*. At the same time it recalls the African wild plant for which I have suggested the name *G. Simpsonii*. It was collected (Nov. 1917) at an altitude of 6000–7000 feet and at 27° N. lat. where one might almost affirm it was beyond the area of *Gossypium*, but another variety of *G. Nanking*, namely *himalayanum*, also reaches sub-tropical conditions, in the North West Himalaya.

Gossypium Simpsonii *Watt*, sp. nov.

Ramuli, petioli pedunculique pilosi, mox glabrescentes, purpurei. *Folia* rotundato-ovato-oblonga, profunde cordata, 3–5–7-loba, fere coriacea, laevia, pallide viridia, purpureo-tincta, praesertim secus marginem undulatam; lobi lineari-oblongi, deorsum sensim constricti, sinu aperto in plicam elevato; stipulae longae, linearilanceolatae, acutae; glandulae inconspicuae, saepius infra nervos tres saltem; nervi utrinque prominentes. *Bracteolae* pro rata parvae, ovatae vel deltoideae, acutae, secus majorem partem marginis dentatae. *Calyx* laxe 5-angulatus vel inconspicue dentatus, venis inconspicuis. *Corolla* flava, unguibus purpureis, extra

tomentosa. *Capsula* subsphaerica, obtuse rostrata, subtrigona, 3-locularis, seminibus 6 pro loculo. *Semina* obpyriformia, lana duplici vestita, altera brevi alba densa, altera longa aspera.

AFRICA. Grown at El Giza, Egypt, from seed procured from the Siwa Oasis, *N. D. Simpson, C. 1* (type).

Twigs, petioles, and peduncles pilose but early becoming glabrescent and all purple coloured. *Leaves* ovate, oblong, rotund, deeply cordate, thick almost leathery, smooth, pale green with a purple tinge, especially along the wavy margin; 3–5–7 (often 7)-lobed, lobes linear-oblong, constricted gradually downwards with the intervening open sinus thrown up in a fold: *stipules* long, linear-lanceolate acute: *glands* obscure though usually present on at least three veins and veins of the leaf prominent on both surfaces. *Bracteoles* relatively small, ovate, acute or deltoid, toothed around the greater part of the margin. *Calyx* loose 5-angled or obscurely toothed, veins inconspicuous. *Corolla* yellow with purple claws, tomentose externally. *Fruit* subspherical bluntly beaked, inclined to be trigonous, 3-celled with 6 seeds in each cell. *Seeds* ob-pyriform. *Fuzz* white, dense. *Floss* rough.

The following may be given as good examples:—Mr. N. D. Simpson furnished not only beautiful botanical specimens (*C. 1*, dated El Giza, 8–5–22) but a detailed description and drawings of the plant, thus critically isolating it; he tells us that seed had been procured from the Siwa Oasis and grown at Giza: Mr. W. Lawrence Balls contributed, what I take to be the same plant, namely his *213–2* (dated 8th December 1906), and his note along with the specimens speaks of it as being the Senaar Tree Cotton. Anterior to these collections, Mr. C. E. Muriel furnished his *S. 51* from J. Ahmed Aga on the White Nile: Mr. S. Simpson submitted a sample of what he calls "Wild Cotton found growing freely near Humbe, Mossamedes, Angola": Mr. P. H. Lamb collected it at Kano, N. Nigeria (his *8*, 8th Jan. 1913) and describes it as a "Perennial cotton which bears in the Hausa language the name *Yerkerfi*": Mr. R. C. Andrew, 5th Jan. 1914, collected the same plant at Kano, alt. 2000 ft. and describes it as a perennial and gives it the same vernacular name already mentioned.

A widely distributed plant, in Tropical Africa, from the Sudan and the White Nile to Angola and Nigeria. Apparently a wild species, at all events it has never been recorded as met with under systematic cultivation. In some respects it might be accepted as embracing all the glabrous, or perhaps rather, the glabrescent conditions of *G. africanum*, though it has a stronger taint of *G. Nanking* and particularly brings to mind the Indian series of cottons thrown into var. *Nadam* race *Coconada*, all perennial thick-leaved plants with purple twigs and even a purple tinge on the foliage and flowers. But while the African representative would seem to be a purely wild plant, the Indian exists entirely under cultivation. Here, not for the first time, we thus get the suggestion of India

having possibly derived some of its cotton stocks from Africa, just as in a further paragraph the opinion is offered of China being similarly indebted to the great African Continent.

Gossypium soudanense *Watt*, sp. nov.

Ramuli, petioli pedunculique glabri, vel innovationes minute sparse pilosi, adulti purpurei. *Folia* magna (usque ad 7·5 cm. longa et 6·5 cm. lata) late ovata, breviter cordata, 3–5–7-loba, tenuiter herbacea, fere glabra, pallide viridia; lobi late lineari-oblongi, acuminati, deorsum minime tantum angustata, sinibus apertis interdum dentibus supplementariis instructis (ut in *G. arboreo*); glandulae parvae, elongatae, irregulares, infra nervos 1–3 vel plures sitae; petiolus lamina longior. *Bracteolae* per $\frac{3}{4}$ partis cordatae connatae, magnae, ovatae, deltoideae, acutae, dimidium corollae superantes, superne dentibus 3–6 acutis, sub fructu accrescentes. *Calyx* laxus; glandulae basales triangulares glandulis epidermidis numerosis parvis furvis circumscriptae. *Corolla* fulva, unguibus purpureis. *Capsula* oblonga, abrupte rostrata, 3-locularis. *Semina* magna, pyriformia, obtusa, lana duplici vestita, altera brevi densa viridi-brunnea, altera fere 2 cm. longa cremeo-alba aspera laniformi. — *G. Nanking* var. *soudanense* Watt, Wild and Cult. Cotton Pl. 123, 138 (1907).

Africa. Khartum, Soudan Country cotton, *A. F. Broun in Sudan Government Herb. 693* (type).

Twigs, petioles and peduncles quite glabrous or with the young structures minutely and sparsely hairy, the older becoming purple coloured. *Leaves* large, maximum 3 by $2\frac{1}{2}$ inches, thin, herbaceous, almost quite glabrous, pale green, broad-ovate with shallow cordature: 3–5–7-lobed, lobes broad, linear-oblong, acuminate and only very slightly tapered below, sinus between the lobes open and sometimes furnished with extra teeth (as seen in *G. arboreum*): *glands*, 1–3 or more, veins carry below small elongated irregular glands that appear sometimes above as well: *petiole* longer than the blade. *Bracteoles* $\frac{3}{4}$ united within the cordature, large, ovate, deltoid, acute, more than $\frac{1}{2}$ the length of the corolla, smooth, with 3–6 sharp teeth around the apex and becoming accrescent on the fruits. *Calyx* loose and glands at the base triangular, outlined by numerous small dark-coloured epidermal glands. *Corolla* yellow with purple claws. *Fruit* oblong, suddenly beaked 3-celled. *Seeds* large, pyriform, obtuse. *Fuzz* copious greenish-brown. *Floss* nearly $\frac{3}{4}$ inch long, creamy white, harsh, woolly.

In shape of leaf this comes nearer *G. arboreum* than *G. Nanking*. It is in fact remarkably like var. *neglectum* (the *Belati* cotton of India) but all the other features of the plant bring it into close affinity to *G. Nanking*.

Apparently a wild species, indigenous to the Soudan and East Africa: a large perennial bush.

The following examples may be cited: *Mr. and Mrs. Broun, 1134*, dated 26–6–07, from Khartum where it is said to be known

as *Beladi* cotton: their *693*, "the Sudan country cotton," a plant with the leaves deeply 7-lobed and very much like a glabrescent *arboreum* with yellow flowers and many glands: also *1099* (3–14–07) "Sudan wild cotton." This is the specimen I provisionally named var. *Brounianum* but I now think it had better be accepted as but a small leaved state of *G. soudanense*. Lastly *Dr. D. Keller, 67* (dated 1891) from Somali-Land is typical of the species.

In the Wild and Cultivated Cotton Plants of the World (p. 123) the reminder is made of the oft repeated opinion that China obtained *G. Nanking* from Africa. It is just possible that it came from *G. soudanense*.

**** Leaves less than half cut into* 5 (*more rarely* 3–7) *lobes; lobes constricted below* (*ogee-shaped*), *obtuse, or acute: base distinctly cordate: central vein only bearing a gland below and the veins gland-like extended into the cordature.*

G. obtusifolium *Roxb.*; Watt, l.c. pp. 79, 139–43, plates 19 and 20.

A large assortment of the varieties and races of this cultivated species exists in Africa and these seem to have descended from an ancient cultivation. But though several closely allied wild species have been found, no example of what could be accepted as a wild *G. obtusifolium* has as yet been recorded. Indeed one is greatly surprised, on turning from a study of the cottons of India, to find how remarkably similar they are to those of the vast Continent of Africa. We have already seen that some of the best forms of *G. arboreum* and of *G. Nanking* are not only cultivated in Africa but that a few of them exist there as indigenous or wild plants. The same experience has now to be recorded with *G. obtusifolium*. Hence it may be affirmed Africa possesses a more extensive and much more varied assortment of cotton plants than is met with in almost any other country. And it will presently be shown that the experience gained both in acclimatisation and hybridisation has been much the same in both countries.

The typical form of Roxburgh's supposed Ceylon plant may be recognised by the following:—

Leaves rotund-oblong, obtuse, base cordate but hardly auriculate, thin, smooth, compact, minutely stellately pilose: lobes more or less ovate-rotund, constricted below and emarginate. *Bracteoles* half the length of the corolla, ovate, entire or coarsely toothed, not very deeply cordate but prominently veined. *Flowers* large, convolvulate, yellow usually with large dark-purple blotches on the claws and a purple tinge on passing to maturity. *Calyx* irregular with 5 large rounded teeth. *Corolla* having a short tube, with the petals only slightly attached. *Seeds* very large, irregular, with a rusty-grey *fuzz* and the *floss* poor, reddish-white, woolly. *Fruit* 3-celled, valves as a rule completely reflexed.

As cultivated plants, the forms that have to be placed under *G. obtusifolium* manifest departures in the inflorescence, which often becomes proliferous; in the bracteoles, which remain ovate,

never assuming the rotund-reniform shape seen in *G. herbaceum*, though they frequently become deeply gashed; in the fruit often becoming 4-celled and sometimes opening imperfectly; and the seeds frequently becoming small and numerous with the floss often considerably improved both in length and texture. They are plants that manifest ready adaptation to soil and climate, and are the most valued of the Asiatic cottons.

Var. **Wightianum** *Watt*, l.c. pp. 143–53, plates 21 and 22.

Todaro, who founded the species *G. Wightianum*, described it originally in the Osservazioni su talune Sp. di Cot., 1863, 47, where he deals with one plant only, but unfortunately in his later publication (Relaz. Cult. dei Cotoni, 1877, pp. 141–6, t. iv. f. 1–9) he grouped several specimens and made a combined description and unfortunately thereby confused the species. The main point aimed at, however, was accomplished, namely the separation of the Indian plant from *G. herbaceum* Linn.

It may be recognised by the following:—*Leaves* ovate-rotund, often coated with persistent, long shaggy hairs over a short tomentum of stellate hairs, especially on the veins below: lobes 5–7 rarely 3, ovate-oblong, acute to acuminate, with the sinuses often thrown up in folds. *Bracteoles* sometimes almost free, relatively small, ovate, obtuse or acute, deeply toothed on the upper margin and nerves prominent.

The specimens that have to be cited may best be assorted under the Races (or cultivated forms) to which they most probably belong:

(*a*) *Kahnami*:

Egypt. Contributed by Mr. N. D. Simpson and grown under his observation at the Egyptian Government Research Station of El Giza near Cairo, namely:—*C. 72*, raised from seed obtained from Surat, India; *C. 74*, grown from seed obtained from Bombay, leaves with the lobes broader than is customary and with the central one considerably elongated, recalling *G. abyssinicum*; *C. 79*, local name "Westerns Hagari, 25"; *C. 779*, not stated where the seed had been procured but is a good cotton and comes very near the so-called Surat long staple, in fact, differs only in degree of woolliness from *72*, *74* and *79*; *C. 783*, not stated from where the seed had been procured but is perhaps the finest specimen of the series and worthy of special consideration.

Tropical Africa. In the Kew Herbarium there is a specimen collected by Sir John Kirk, during the Livingstone Zambesi Expedition, above Lupata, between Tette and the sea coast, *283*, dated 22–4–60 and named *Tonje kaja*. Attached to the specimen is the following instructive note:—

"*Tonje kaja* or native cotton, is cultivated by the people on Zambesi and up the Shiré to Lake Nyasa. It is the primary sort and exists everywhere not having been driven out completely by

the *''Manga''**. Its cotton adheres to the seed which remains woolly after being picked. It is stiff and much resembles wool. The amount yielded is less.

"The plant differs in its leaves being more divided—5-angled or lobed—few entire cordate. Involucre not much divided into segments. Corolla with purple at the base of petals."

When writing the Wild and Cultivated Cottons I formed the opinion (p. 135) that the *Tonje kaja* might be accepted as a cultivated state of the Indian *Roji* cotton. With a greatly extended series of African specimens before me, I now think a more definite pronouncement possible. I accordingly accept the *Tonje kaja* as an example of what is known in Indian commerce as Surat Cotton and very near to the *Kahnami*.

Within recent years an effort has been made to improve and extend cotton production within the British Empire, but it seems likely the fine cotton (*Tonje kaja*) here discussed had been extensively grown in East Africa long before any such steps had been taken in that great Continent. And yet the story of the introduction of *G. hirsutum*, the *Tonje manga*, is exactly parallel with the experience and results attained in India when *G. hirsutum* was introduced and crossed with the fine old cottons of Western and Central India.

(*b*) *Goghari*:

Egypt. Research station of El Giza:—*C. 791*, raised from Indian seed; also *C. 785* from Indian seed.

Tropical Africa. Collected by *T. Thornton* at Ilorin Aguji, N. Nigeria, October 1913. This remarkable plant brings to mind *G. abyssinicum*, though I think its correct position is here among the Surat cottons, but whether indigenous or introduced to Nigeria has not been stated. The bracteoles are large ovate-acute, cordate, deeply toothed, and only very slightly united; ovary 3-celled; seeds irregular with rusty fuzz and silky floss and with the beak very pronounced.

(*c*) *Lalio* or *Dhollera*:

Egypt. *C. 787*, seed procured from India and grown at El Giza. Lobes of the leaves show a tendency to become linear-oblong. In the *lalio* cottons the wool flows from the pods like the saliva from the mouth of a bull. (Confer with *G. transvaalense* below).

(*d*) *Uppam*:

Egypt. *C. 67*, Dhawar seed grown at El Giza—a typical specimen; *C. 108*, Dhawar seed raised at El Giza; this specimen gives indications of hybridism with *G. Nanking*—the lobes of the leaves are drawn out, thin and smooth, as in the *Bani* cottons, and glands are present on more than the central vein.

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* The *Manga* is *G. hirsutum*, and the comparison drawn is between that species and *G. obtusifolium*.

Tropical Africa. Dr. E. G. Irving collected a *Gossypium* at Abbeokuta in Lagos, his *2*, February 1855, a specimen of which is preserved in the Kew Herbarium. Dr. Irving made a special study of the cottons of West Africa and published in Hooker's London Journal of Botany, vii, 1855, pp. 297–302 "Notes on the Cultivation of Cotton in Western Africa." The specimen here alluded to is *G. obtusifolium* Roxb. var. *Wightianum*, race *Uppam*. Dr. Irving's specimens, descriptions and practical observations regarding the cottons and the cotton cultivation of West Africa seventy years ago are invaluable. They show intelligence and skill in no way inferior to that possessed by the Indian cultivators of the same period. And they throw a flood of light on the cultivated forms of *G. punctatum* and *G. peruvianum*.

Recently Mr. G. C. Dudgeon studied the cottons of the Gold Coast, and one of his specimens, dated 11–11–17 (preserved in the Edinburgh Herbarium), agrees very closely with Dr. Irving's plant. We thus learn that seventy years ago and to-day a cotton is being grown on the West side of Africa that represents the *Uppam* cottons, while on the East side Sir John Kirk's *Tonje kaja* takes the place of the Surat cottons.

(e) *Kanvi*.

India. *516*, collected by *Sir A. G. and Lady Bourne* at Amarapura in Madras.

(f) *Tellapathi*.

Africa. *Dr. Irving, 33*, collected at Abbeokuta, is obviously a hybrid of *G. obtusifolium* × *hirsutum* perhaps *purpurascens*, very similar to the *Tellapathi* hybrid cottons of South India and might possibly be included under the *Manga* of Sir John Kirk.

Gossypium africanum *Watt*, sp. nov.

Ramuli petioli pedunculique graciles, teretes, breviter tomentosi, demum glabrescentes, purpurei. *Folia* rotundato-ovata, cordata, usque ad 3 cm. longa et fere 4 cm. lata, usque ad medium 3–5 (rarius 7) -loba, tomentosa margine incrassato reflexo ciliato; lobi ovati, acuti, nonnonquam setiferi et tunc saepe obtusi; lobus medius fere ellipticus in sinus acutos constrictus; stipulae parvae, lineares; glandulae inconspicuae, solitariae, saepius unica infra nervum centralem tantum. *Bracteolae* dimidium corollae haud aequantes, late ovatae, acutae, crasse coriaceae, dentibus marginalibus triangularibus, haud accrescentes. *Calyx* laxus, dentibus 5 brevibus latis abrupte acutis; glandulae bracteolis alternantes, saepe phyllis bracteolaribus propriis tectae. *Corolla* magna, flava, purpureo-maculata. *Capsula* rotundata, 3-locularis. Semina ovata, lana duplici vestita, altera brevi compacta rufo-grisea, altera longiore laniformi firme affixa.—*G. obtusifolium* var. *africanum* Watt, Wild and Cult. Cotton Pl. 153–55, t. 23 (1907).

Ngamiland. Kwebe Hills, *Mrs. Lugard, 198* (type).

Twigs, petioles and peduncles slender, round, shortly tomentose but becoming glabrescent and purple. *Leaves* ovate-rotund,

cordate, tomentose, maximum size 1¼ in. long by 1½ in. broad, half cut into 3–5 (rarely 7) lobes, the lobes ovate, acute, occasionally bristle-tipped, and then often obtuse, central lobe nearly elliptical, constricted into the acute sinuses, margin thickened, reflexed and ciliate; *stipules* small, linear; *glands* not conspicuous, one usually on the central vein below. *Bracteoles* thick, leathery, less than one-half the length of the corolla, broad, ovate, acute, triangularly toothed around the margin, not accrescent on the fruit. *Glands* on the calyx alternating with the bracteoles and often protected by bractlets. *Calyx* loose and having 5 short, broad, suddenly acute teeth. *Corolla* large, yellow, with purple blotches. *Fruit* rotund, 3-celled. *Seeds* ovate. *Fuzz* compact, rufous-grey. *Floss* short and poor, woolly, and firmly attached to the seed.

A spreading bush 3–4 feet in height, never recorded as met with under cultivation but very widely distributed in Africa from the Upper Nile to Moçambique and the Transvaal to Nigeria. Flowers apparently during the winter months.

The following examples may be cited:—*Dr. Pfund, 474*, March 1895 in Kordofan; *Mrs. E. J. Lugard, 198* (the specimen in flower in February) found on the Kwebe Hills, alt. 3000 feet, Ngamiland; *W. H. Johnson, 76* (*b*) from Mutumura (has the internal glands large but naked), it flowered in January 1907, Moçambique; Livingstone, Zambesi Expedition, Mount Chiradzura, (September 1861); *Dr. A. Rehmann, 5227*, Boshveld, Kippan, Transvaal; *F. A. Rogers, 107* (in fruit July) "Growing apparently wild," Komati Poort (alt. 600 ft.), East Transvaal; *W. R. Elliott, 135* (in flower Dec. 1904), on the banks of Komadugu Waube, N. Nigeria.

Mr. W. H. Johnson drew attention to the existence of two forms of this plant in Moçambique, his *76* (*b*), which is typical *G. africanum*, and *76* (*a*), which I separate as a new variety, *bracteatum*.

Gossypium africanum *Watt*, var. **bracteatum** *Watt*, var. nov.

Caules quam in *G. africano* typico sparsius induti. *Bracteolae* majores, crassiores, grossius dentatae.

Moçambique. Between Mussuquana and Buzi, *W. H. Johnson, 76* (*a*) (type).

According to Mr. Johnson, his *76* (*a*) is a small compact much-branched shrub, 3 ft. high, and is evidently indigenous in Moçambique. The stems are less hairy than in typical *G. africanum* and the bracteoles larger, thicker and more coarsely toothed, all round the margin. The same variety was collected in 1894 by *M. Rautenen, 57*, in Amboland.

The variety here separated might be viewed as a hybrid between *G. africanum* and *G. Kirkii*, having the strongly marked bracteoles of the latter.

Gossypium transvaalense *Watt*, sp. nov.

Ramuli petioli pedunculique canescenti-lanati, tandem glabrescentes, purpurei. *Folia* rotundato-reniformia, cordata, usque ad 2·5–4 cm. longa et 4–5 cm. lata, 3–5-loba, velutina; lobi rotunde ovato-oblongi, acuti vel obtusi, raro setiferi, in sinus acutos constricti; lobus centralis multo maximus; stipulae breves, ovatae, acuminatae; glandula unica infra nervum centralem, sed tomento stellato saepe occulta. *Bracteolae* parvae, dimidium corollae aequantes, late ovato-reniformes vel subdeltoideae, dentibus ascendentibus vel conniventibus. *Calyx* laxus, breviter 5-dentatus vel angulatus tantum. *Capsula* rotundata, 3-locularis, post dehiscentiam subapplanata. *Semina* magna, rotundata, lana duplici vestita, altera brevi pilis intertextis, altera longiore sordide albida aspera firme affixa.

Transvaal. Komati Poort, *Burtt Davy*, *369* (type).

Twigs, petioles and peduncles canescent woolly, older structures glabrescent and purple. *Leaves* rotund-reniform cordate, maximum size 1 to 1½ inches long, 1½ to 2 inches broad, velvety, 3–5-lobed the central lobe often much the largest; lobes rotund, ovate, oblong, acute or obtuse, rarely bristle-tipped, constricted into the acute sinuses; *stipules* short, ovate, acuminate; *glands* one on the central vein but often hidden by the stellate tomentum. *Bracteoles* small, half the length of the corolla, broad, ovate-reniform to deltoid, with ascending or connivent teeth. *Calyx* loose, with 5 short teeth or simply angled. *Fruit* rotund 3-celled opening nearly flat. *Seeds* large, rounded, coarse, ejected like a cascade, the seeds appearing scattered within the dirty white floss. *Fuzz* matted grey to rusty. *Floss* very inferior, dirty white, harsh, greasy in appearance, more like wire than wool or silk, firmly adhering to the seed and of no textile value.

A small bush, apparently wild—there is no record of its having been met with under cultivation. It is no doubt closely allied to *G. africanum* though much less widely distributed. The examples seen by me would appear to fix its distribution from Nyasaland to Portuguese East Africa and the Transvaal. It would seem to flower and fruit throughout the year.

The following specimens may be here recorded:—Collected by *Petherick* from the White Nile, April 1868, "Not cultivated but probably introduced"; *W. Goetze*, *75* from Nyassa, leaves exceptionally small thick narrow lobed, suggestive of being a hybrid from *G. arboreum*; *F. A. Rogers*, *21,351* from Lourenço Marques, Portuguese East Africa; *M. T. Dawe*, *464* from Madanda Forest; *Moss and Rogers*, *6997*, from Messina; *Rogers 2647* from Komati Poort, Transvaal; *Burtt Davy*, *369*; *E. E. Galpin*, *742* from Kaap River Valley, Barberton, alt. 2,000 ft.; *H. Bolus*, *7680* from Delagoa Bay.

This botanically interesting African species has its closest affinity with *G. africanum*, though its bracteoles are reminiscent of *G. Kirkii*. According to Dawe it bears a distinctive vernacular

name *M'Gauma*, and its seeds are recognised as of value as edible nuts—facts that point to ancient knowledge. The dehiscence of the fruit and the appearance of the large round rufous seeds, floating in the scant harsh dirty useless floss, are the readiest eye-marks of the species. The wool flowing from the pod brings to mind the *lalio* cottons of India.

Gossypium abyssinicum *Watt*, sp. nov.

Ramuli petioli pedunculique dense tomentosi, saepe sublanati. *Folia* late ovata, profunde cordato-auriculata, grosse tomentosa, 3-5-loba (saepius 5-loba); lobi ovato-oblongi, acute acuminati, setiferi, deorsum angustati, interdum curvo duplici "ogee" dicto circumscripti; glandulae saepe infra nervos omnes sitae; stipulae longae, obliquae, lineari-lanceolatae. *Bracteolae* magnae, dimidium corollae aequantes, rotundato-ovatae, cordatae, profunde acute dentatae, venis tomento brevi pallido tectis itaque conspicuis. *Calyx* laxus apertus, angulatus vel obtuse 5-dentatus, venis propter tomentum conspicuis; glandulae maximae, nudae. *Corolla* flava. *Capsula* immatura abrupte rostrata, matura rotundata. *Semina* irregularia, lana duplici vestita, altera brevi griseo-rufa pilis intertextis, altera longiore facile detergibili.

Abyssinia. *Quartin-Dillon and Petit, 267* (type).

Twigs, petioles and peduncles densely tomentose, often almost woolly. *Leaves* broad, ovate, deeply cordate, auricled, coarsely tomentose, 3–5- (mostly 5) lobed; lobes ovate-oblong, the central one often much drawn out, all acute-acuminate and bristle-tipped, also tapered below till sometimes ogee-shaped; *glands* apparently present and often on all the veins below; *stipules* long oblique linear-lanceolate. *Bracteoles* large, fully half the length of the corolla, ovate, rotund, cordate, deeply and acutely toothed round the margin, and the veins made conspicuous through being coated with a short pale-coloured tomentum. *Calyx* open, loose, angled or with 5 blunt teeth, and the veins outlined by tomentum, also with the glands on the calyx very large and naked. *Corolla* yellow. Young *fruit* suddenly beaked, ripe rotund. *Seed* irregular, coated with matted grey-rufous *fuzz* and poor, easily separable *floss*.

A coarse, thick, densely hairy plant, met with in the East Sudan and Abyssinia.

The following collections may be mentioned:—*Sieber* (ex Herb. J. Gay) from Upper Egypt; *Purdy, 61*, Expedition Darfour; *Barter* from Nupe; *Quartin-Dillon and Petit, 267* from Abyssinia; *Schimper, 691* from Abyssinia, leaves more drawn out and less tomentose than is customary, may possibly be a hybrid.

This little known plant recalls very strongly the Indian *Gossypium obtusifolium* Roxb. var. *Wightianum* race *Wagria*: it is far too hairy to be accepted as a form of *G. herbaceum* Linn.

G. herbaceum *Linn.*; Watt, l.c. pp. 79, 155-63, plates 24 and 25.

Twigs, petioles and peduncles round, green, sparsely pilose conspicuously gland dotted but in some forms the stems, etc.,

become purple and the dots inconspicuous. *Leaves* almost reniform, distinctly cordate-auriculate, leathery, glabrescent on maturity, often prominently reticulate, blade less than half cut into 3–5–7 lobes; the lobes broad, ovate, rotund, suddenly acute or apiculate, irregular below thinly pilose and with the sinuses thrown up in folds; *stipules* long, linear, acuminate; *glands* on the veins below, sometimes appearing on more than the central one (an evidence very possibly of hybridism). *Bracteoles* green, broadly ovate-rotund, obtuse, only very slightly united but prominently cordate, gashed across the top into 7–9 fairly long irregular teeth, which decrease right and left. *Inflorescence* proliferous, forming many lateral spurs that carry two or more flowers, sometimes almost becoming "clustered"; stipules of the small leaves of the spurs elliptic acuminate. *Flowers* not very large but about twice the length of the bracteoles, yellow with purple claws. *Calyx* large, loose, undulate, or with short rounded teeth.

The leaves in the Herbarium dry into a pale lemon green.

A small bush often not more than one to two feet high. It is not known to exist anywhere in a wild state, though it seems probable that it is indigenous in North Arabia and Asia Minor. Its cultivation and distribution seem closely connected with the rise of the Muhammadan power. It was finally dispersed over the Mediterranean region and carried to Syria, Mesopotamia, Egypt, Persia, Afghanistan, Beluchistan and the North-West Frontier Province of India. Ultimately it was taken to the United States of America where it yielded, for a time, the "Short Staple" of that country.

The following examples may be cited:—

Egypt. Mr. N. D. Simpson has contributed an interesting series procured from the experimental Station of El Giza. These are as follows:—*C. 280* and *284*, *G. herbaceum* with a possible strain of *G. Nanking*. The plants were raised from seed procured from the Khargeh Oasis so that they may be accepted as representing an Egyptian stock. At first I thought they might prove a cultivated state of the plant I then called *G. obtusifolium* var. *africanum*, but with better material I now regard them as *G. herbaceum* hybrids. *C. 128*, same remark as above except that the seed had been procured from the Siwa Oasis. *C. 129*, *G. herbaceum* × *hirsutum* was grown from seed obtained from Malta; it bears external glands on the bracteoles within their cordature and the peduncles are sharply angled, features not met with in pure Asiatic cottons. Many of the short staple cottons of modern commerce belong to hybrids of this type. *C. 61*, *G. herbaceum* Linn., grown from seed procured from Cyprus.

Tropical Africa. It seems probable that this was one of the earliest species to be raised as an annual crop and further that it may have originated as such in Mesopotamia or Persia. It is, however, remarkable that among the extensive sets of African plants, collected during the past century, there should be no

examples of wild or cultivated *G. herbaceum*, except the Egyptian examples above indicated.

**** *Leaves less than half cut into 3 lobes, ovate-cordate; the lobes deltoid acute dentate, sinuses open; veins obscured by the tomentum; glands apparently absent.*

[It has been assumed that the seeds are fuzzy.]

Gossypium Bakeri *Watt*, sp. nov.

Ramuli petioli pedunculique tomento denso cinereo obtecti, pilis intertextis sed haud stellatis. *Folia* ovata, cordata, haud ad medium 3-loba, crassa, dense tomentosa, nervis tomento omnino occultis; lobi deltoidei, acuti, sinibus late apertis. *Bracteolae* ovato-oblongae, acutae, integrae, inferne ultra medium connatae, conniventes, multinerviae, levissime cordatae, glandulis manifestis nullis. *Calyx* brevis, cupuliformis, dentibus 5 longis triangularibus apice pilosis. *Flores* (secundum collectorem) iis *G. neglecti* Tod. similes.

India. Sind: Karachi Desert; near Gharo, *C. N. Baker* (type).

Twigs, petioles and peduncles densely coated with a cinereous tomentum, the hairs of which are matted but not stellate. *Leaves* thick, ovate, cordate, densely tomentose, less than half cut into 3-lobes; lobes deltoid acute (dentate on the leaves of the young foliage) with the sinuses between the lobes gaping open and the veins entirely hidden within the tomentum. *Bracteoles* ovate, oblong, acute, quite entire, more than half united below, thin, glabrescent, connivent (in bud closed like a bivalved shell with the margin of the outermost one turned over the others), multinerved, only very minutely cordate. No *glands* visible either internal or external. *Calyx* a compact short cup ending in 5 long triangular teeth, hairy on the tips. *Corolla*, *Fruit* and *Seed* not seen, but Mr. Baker speaks of the flower as being like that of *G. neglectum*.

Mr. C. N. Baker, January 30th, 1921, collected in the desert of Sind, near Gharo, Karachi, India, a plant which he called *Gossypium Stocksii*, a name corrected (in the Herbarium) into *G. obtusifolium* Roxb., but it is a perfectly distinct new species. The material, however, is very unsatisfactory, though a flower bud which I dissected enabled me to see certain features that are most distinctive. It is undoubtedly a wild species and was found in the Sind desert 5 miles from the nearest field and 50 miles from cotton cultivation. Moreover, it does not look as if it could have been cultivated. At all events there is no trace of its influence in any known Indian hybrid.

I have ventured to name the plant, and have associated it with the discoverer.

XXVII.—ADDITIONS TO THE INDEX KEWENSIS: VIII.*

The attention of Kew has been drawn by Mr. Alfred Rehder to the fact that K. Koch's Hortus Dendrologicus, which contains many new names, has been almost entirely overlooked. This work, which bears the date 1853, consists of xvi pages of introduction and 354 pages of text, the latter being divided into seventeen "Orders," each followed by a separate index. The introduction and pages 1–195 seem to have been issued separately in advance, judging by a copy in the Library of the Kew Herbarium. This stops at p. 195, which bears the printer's name at the bottom, page "196" being entirely blank. The copy in question formed part of Sir William Hooker's Library, and may have been sent to him by K. Koch, with whom he was in correspondence at that date.

Many combinations made by later authors first appeared in the Hortus Dendrologicus. Thus *Ampelopsis cantoniensis* K. Koch and *Benthamia disciflora* K. Koch antedate *A. cantoniensis* Planch. (1887) and *B. disciflora* Nakai (1909).

The well-known Himalayan Ivy should now bear the name *Hedera nepalensis* K. Koch (1853) in place of *H. himalaica* Tobler (1912).

The total number of names published for the first time in the Hortus Dendrologicus exceeds 100. A few, e.g. *Viburnum sempervirens*, were taken up later, either by Koch himself or by other authors, and hence were cited in the Index Kewensis. The names overlooked will be included in the seventh Supplement of the Index Kewensis.

The new names are given in the left-hand column and are followed by the page and number of the Hortus Dendrologicus and by the binary name on which they are based.

M. L. G.

K. Koch, Hortus Dendrologicus (1853).

Acer
saccharophorum 80, No. 49: A. saccharinum *F. A. Michx.* Hist. Arbr. For. Am. Sept. ii. 218, t. 15 (1812), non *Linn.*

Ampelopsis
cantoniensis 48, No. 11: Cissus cantoniensis.

Androsaemum
adenophyllum 65, No. 7: Hypericum adenophyllum.
emarginatum 65, No. 2: Hypericum emarginatum.

Anthocoma, gen. nov. (Ericac.).
aromatica 338, No. 1: Rhododendron aromaticum.

Armeniaca
minutiflora 140, No. 6: Prunus minutiflora *Engelm.*
mume 140, No. 7: Prunus mume.

Arthrocnemum
macrostachyum 96, No. 3: Salicornia macrostachya.
radicans 96, No. 2: Salicornia radicans *Guss.* Suppl. Fl. Sic. Prodr. 1 (1832), non *Sm.*

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* Continued from *Kew Bull.* 1926, p. 32.

(18914.) B 2

Aspalathoides, gen. nov. (Legumin.).
Aspalathi 242, No. 4 : Anthyllis Aspalathi.
Cytisi 242, No. 1 : Anthyllis cytisoides.
Genistae 242, No. 2 : Anthyllis Genistae.
Hermaniae 242, No. 3 : Anthyllis Hermaniae.
Astragalus
songarica 236, No. 17 : A. oligophyllus *Schrenk.*
Aurinia
leucadaea 23, No. 4 : Alyssum leucadaeum.
Benthamia
disciflora 285, No. 3 : Cornus disciflora.
Berberis
Gayi 19, No. 66 : B. brachybotrya *C. Gay.*
Brathydium
ambiguum 66, No. 4 : Hypericum ambiguum *Ell.*
aureum 66, No. 1 : Hypericum aureum *Bartram.*
fastigiatum 67, No. 8 : Hypericum fastigiatum *Ell.*
fulgidum 67, No. 10 : Hypericum fulgidum.
myrtifolium 66, No. 2 : Hypericum myrtifolium, *Lam.*
nudiflorum 66, No. 5 : Hypericum nudiflorum *Michx.* Fl. Bor. Am. ii. 78 (1803).
Rugelianum 67, No. 9 : Hypericum Rugelianum.
Cardiospermum
Loureiroi 58, No. 1 : C. Corindum *Lour.* Fl. Cochinch. 239 (1790), non *Linn.*
Cerasus
brachybotrya 147, No. 54 : Prunus brachybotrya.
microcarpa 145, No. 17 : Prunus microcarpa.
samydoides 147, No. 53 : Prunus samydoides.
Schiedeana 147, No. 58 : Prunus Schiedeana.
Chenopodina
heterocarpa 97, No. 6 : Suaeda heterocarpa.
Chronanthos, gen. nov. (Legumin.).
liparioides 248, No. 1 : Genista liparioides.
pulchella 248, No. 2 : Genista pulchella.
Villarsii 248, No. 3 : Genista Villarsii.
Clematis
Nuttalii 10, No. 27 : C. parviflora *Nutt.*
Corniola
diffusa 247, No. 11 : Genista diffusa *Ten.*
dracunculoides 248, No. 15 : Genista dracunculoides.
ferox 248, No. 17 : Genista ferox.
lucida 248, No. 22 : Genista lucida.
Melia 248, No. 20 : Genista Melia.
pontica 247, No. 3 : Genista pontica.
tenella 248, No. 16 : Genista tenella.
Cotoneaster
nebrodensis 179, No. 6 : Mespilus nebrodensis.
Crataegus
hypolasia 167, No. 17 : C. mexicana *D. Don.*
Dorycnium
pseudocytisus 240, No. 2 : Cornicina pseudocytisus.
Elaeocarpus
Zollingeri 49, No. 3 : E. japonicus *Turcz.*
Eremanthe
cordifolia 65, No. 4 : Hypericum cordifolium.
venosa 65, No. 3 : Hypericum venosum.
Euonymus
Lindleyi 212, No. 18 : E. chinensis *Lindl.*

Genistella
capitata 249, No. 1 : Genista umbellata var. capitata, *DC.*
equisetiformis 249, No. 2 : Genista equisetiformis.
umbellata 249, No. 3 : Genista umbellata, *Poir.*
Glochidium
dasyphyllum 85, No. 3 : G. molle *Hook. & Arn.*
Halimium
alyssoides 32, No. 9 : Cistus alyssoides.
calycinum 31, No. 5 : Cistus calycinus.
cheiranthoides 32, No. 11 : Cistus cheiranthoides.
coriaceum 32, No. 15 : Helianthemum coriaceum.
formosum 32, No. 10 : Cistus formosus.
pomeridianum 32, No. 14 : Helianthemum pomeridianum.
sericeum 31, No. 2 : Cistus sericeus *Munby.*
syriacum 32, No. 13 : Helianthemum syriacum *Boiss.*
ternifolium 32, No. 12 : Helianthemum ternifolium.
Hedera
nepalensis 284, No. 5 : H. Helix *Wall.* in Roxb. Fl. Ind. ii. 515 (1824) ; D. Don, Prodr. Fl. Nep. 187 (1825), non *Linn.*
Helianthemum
Jaubertii 33, No. 10 : Fumana grandiflora.
Spachii 33, No. 5 : Fumana Spachii.
Hypericum
Loureiroi 65, No. 12 : H. olympicum *Lour.* Fl. Cochinch. 471 (1790), non *Linn.*
Koniga
Lapeyrousiana 23, No. 4 : Alyssum Lapeyrousianum.
longicaulis 23, No. 2 : Alyssum longicaule.
tortuosa 23, No. 1 : Ptilotrichum tortuosum.
Laburnum
Alschingeri 253, No. 4 : Cytisus Alschingeri.
Magnolia
Sieboldii 4, No. 11 : M. parviflora *Sieb. & Zucc.*
Melia
Hasskarli 72, No. 4 : M. japonica *Hassk.*
Mespilus
mexicanus 167, No. 17 : Crataegus hypolasia.
Myriandra
adpressa 66, No. 2 : Hypericum adpressum.
rosmarinifolium 66, No. 3 : Hypericum rosmarinifolium *Lam.*
Norysca
Kalmiana 66, No. 6 : Hypericum Kalmianum.
urala 66, No. 3 : Hypericum uralum.
Opuntia
chinensis 279, No. 6 : Cactus chinensis.
Persica
cordifolia 140, No. 4 : Amygdalus cordifolia.
Pterospartum
cantabricum 243, No. 4 : Genista cantabrica.
lasianthum 242, No. 1 : Genista lasiantha.
scolopendrium 242, No. 2 : Genista scolopendria *Spach.*
stenopterum 242, No. 3 : Genista stenoptera.
tridentatum 243, No. 5 : Genista tridentata.
Pyrus
Roxburghii 183, No. 42 : P. chinensis *Roxb.*
Rhamnus
Roylei 205, No. 32 : R. rupestris *Royle.*
Ribes
chilense 275, No. 35 : R. villosum *Gay.*
longispinum 274, No. 19 : R. Grossularia *Wall.* in Roxb. Fl. Ind. ii. 515 (1824), non *Linn.*

Ribes—*continued*.
melanocarpum 275, No. 26 : R. glaciale.
monticola 276, No. 44 : R. leptostachyum *Benth.*
tomentosum 273, No. 11 : R. villosum *Nutt.*
Rosa
latispina 129, No. 85 : R. macrophylla *Wall.* Pl. As. Rar. ii. 19, t. 117 (1831), non *Lindl.*
pisifera 132, No. 113 (nomen nudum).—Armen.
Rottlera
cochinchinensis 87, No. 1 : Mallotus cochinchinensis.
Rubus
Hookeri 115, No. 91 : R. rosaeflorus, Hook.
mexicanus 114, No. 38 : R. occidentalis *Schlecht.* in Linnaea, xiii. 271 (1839), non *Linn.*
uniflorus 114, No. 35 : R. Thunbergii *Sieb. & Zucc.*
Sorbus
edulis 176, No. 5 : Pyrus edulis.
florentina 176, No. 3 : Crataegus florentina.
gracilis 178, No. 22 : Pyrus gracilis.
praemorsa 178, No. 17 : Pyrus praemorsa.
Spartocytisus
acutangulus 250, No. 2 : Cytisus acutangulus.
Sphenocarpus
pterocarpus 5, No. 1 : Magnolia pterocarpa.
Teline
Atleyana 254, No. 4 : Cytisus Atleyanus.
bracteolata 254, No. 3 : Genista bracteolata *Link.*
eriocarpa 254, No. 2 : Genista eriocarpa.
Vitis
Kaempferi 47, No. 6 : V. Labrusca *Thunb.*
Zanthoxylum
Beecheyanum 81, No. 7 : Fagara piperita *Hook. & Arn.* Bot. Beech. Voy. 261 (1836–40), non *Linn.*

XXVIII.—THE TAXONOMIC POSITION OF HOHERIA LYALLII.

T. A. Sprague and V. S. Summerhayes.

In 1852 J. D. Hooker described specimens collected by Lyall and Forster in the South Island of New Zealand as a new species of *Hoheria*, *H. Lyallii*, for which he established a new subgenus, *Apterocarpa*, differing from *Euhoheria* by the carpels and styles being 10 in number and the partial fruits not being winged.

He distinguished typical *H. Lyallii*, based on a flowering specimen from hills west of Canterbury, and a variety β "foliis glabratis duplicato-dentatis lobulis acutis," based on fruiting specimens from Dusky Bay and Milford Sound on the south-west coast, and suggested that the latter might possibly represent a different species. The characters of the fruit and the name *Apterocarpa* were derived from the var. β, Hooker having assumed that typical *H. Lyallii* had similar fruits: in this assumption—which has proved to be erroneous—he has been followed by all subsequent workers.

Hoheria Lyallii has had a chequered taxonomic history, having been transferred successively to the genera *Plagianthus*, *Sida* and

Gaya by Asa Gray and Hooker, F. Mueller, and E. G. Baker respectively.

Asa Gray* suggested that *H. Lyallii* should be assigned to *Plagianthus* on account of its introrse stigmas and the total absence of wings to the fruit, and in this he was followed by Hooker†, who actually made the transference.

In 1864 F. Mueller‡ removed *H. Lyallii* from *Plagianthus* to *Sida* on the following grounds. "From various parts of New Zealand our collection possesses plants of *Plagianthus Lyallii* (Asa Gray, Botany of United States Explor. Expedition, 181), although only in a flowering state. These show the number of styles to be variable from 10 to 15 (10, 11, 13, 15), whilst the stigmata are oblique-terminal, very slightly or hardly decurrent, sometimes more curvate-clavate, sometimes so thickened as to appear capitate and to offer a transit to the more decidedly peltate stigma of *Hoheria populnea*. Thus the habit of the plant, its bisexual flowers and its stigmata mediate a clear transit to *Sida*, from which the closely allied *Hoheria populnea*, in appreciation of its winged carpels, can be also only sectionally separated, as indicated in the Fragm. Phyt. Austr. i. 29. A curious variety of *Sida Lyallii*, with small deeply incised leaves, collected by Mr. Travers and Dr. Haast in Middle Island, may be distinguished as var. *ribifolia*." He overlooked the fact that his var. *ribifolia* was typical *H. Lyallii*.

E. G. Baker§ in 1892 transferred *Plagianthus Lyallii* to *Gaya*, apparently on account of the fruits not being winged, but the absence of an internal carpellary appendage in both *H. Lyallii* and its var. β seems sufficient to exclude them from the genus *Gaya*, from which they also differ in habit. The presence of such an appendage is the salient diagnostic character of *Gaya*, not found in any other genus of *Malvaceae*.

T. Kirk tacitly treated Hooker's var. β as typical *Lyallii*, as is evident from his figure and his descriptions of the leaves and stigmas‖. He accepted Mueller's var. *ribifolia* (as *Gaya Lyallii* var. *ribifolia*). In this transposition of the type and variety of *Gaya Lyallii*, Kirk has been followed by Cockayne¶, who, moreover, has raised var. *ribifolia* to specific rank as *G. ribifolia*.

That there are two separate species is confirmed by us as a result of the examination of the material in the Kew Herbarium and of further specimens received from Dr. H. H. Allan. *G. ribifolia*, however, agrees with the type of *G. Lyallii* and should therefore be treated as an absolute synonym of the latter. It is Hooker's var. β which should be separated as a distinct species.

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* Bot. U.S. Expl. Exped. i. 181 (1854).
† Fl. N.Z. ii. 326 (1855).
‡ Veg. Chatham Isl. 10 (1864).
§ Journ. Bot. 1892, 137.
‖ For. Fl. N.Z. 279, t. 134 (1889); Stud. Fl. N.Z. 72 (1898).
¶ Trans. N.Z. Inst. 1900, xxxiii. 272 (1901).

Examination of fruiting specimens of *G. Lyallii* (*G. ribifolia*) shows that the partial fruits possess small dorsal wings, thus affording a transition between *Hoheria populnea*, which has conspicuous wings, and *H. Lyallii* var. β, in which there are none.

Comparison of the stigmas of these three species shows that in this respect Hooker's var. β is intermediate between *H. populnea* and typical *H. Lyallii*, having very slightly oblique or almost capitate stigmas, as was noted by Kirk, who in 1889 had apparently seen only var. β. The only remaining generic distinction between *Hoheria populnea* and the two other species is that of the number of carpels (5 in *H. populnea*, 10–15 in *H. Lyallii* and var. β). This gap is partly bridged, however, by *H. sexstylosa*, in which the carpels vary from 6 to 7.

Furthermore the facies of *G. Lyallii* and var. β is very similar to that of *Hoheria populnea*. We have therefore come to the conclusion that *H. populnea* (and its segregates), *H. Lyallii*, and *H. Lyallii* var. β, for which we propose the name *H. glabrata*, are congeneric, and re-assign the last two to the genus *Hoheria*, of which the generic description has in consequence to be modified considerably.

As thus circumscribed, *Hoheria* has 5–15 carpels, capitate or more or less obliquely decurrent stigmas, and partial fruits with or without wings. It has hitherto been distinguished from *Sida* by its winged partial fruits, but this distinction breaks down in the case of *H. glabrata*. *Hoheria* in fact differs from *Sida* not so much in fixed technical characters as in its different evolutionary tendencies. All the species of *Hoheria* under suitable conditions may assume the form of small trees up to 30 feet in height, whereas the species of *Sida* are herbs or undershrubs. In the possession of capitate stigmas *H. populnea* agrees with the genus *Sida*, in which this is a constant character ; but a tendency to obliquity of the stigmas occurs in other species of *Hoheria*, *H. glabrata* having obliquely capitate stigmas, while in *H. Lyallii* the stigmas are introrsely decurrent. A similar series is observable in respect to the fruit: *H. glabrata* agrees with *Sida* in its apterous partial fruits, whereas *H. Lyallii* has small dorsal wings, and this tendency reaches its maximum development in the conspicuous wings of *H. populnea*.

As regards the number of carpels, the nature of the stigmas and partial fruits, and other characters, *Hoheria populnea*, *H. sexstylosa*, *H. Lyallii* and *H. glabrata* form a series—or rather several different series—of connecting links between the genera *Plagianthus* (from which we exclude *Halothamnus** and *Lawrencia*) and *Sida*, as indicated below.

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* See Stapf in Proc. Linn. Soc. 1908–9, 9.

Genus or Species.	Carpels.	Stigmas.	Partial fruits.	Wings of fruit.	Habit.
Plagianthus	1–5	oblique	rounded, sub-coriaceous	none	Trees or shrubs
H. populnea	5	capitate	compressed, membranous	large	Trees or Shrubs
H. sexstylosa	6–7	capitate	compressed, membranous	large	Trees or Shrubs
H. Lyallii	10–15	oblique	compressed, membranous	small	Trees or Shrubs
H. glabrata	10–15	obliquely capitate	compressed, membranous	none	Trees or Shrubs
Sida	5-∞	capitate	compressed, membranous	none	Herbs or Under-shrubs

From the inspection of the above table it can be seen that it is impracticable to assign the four species here included in *Hoheria* to two or more genera, since there is no correlation between the number of carpels, the nature of the stigma, and the presence or absence of wings on the partial fruits.

The genus *Hoheria* is apparently related to *Sida* on the one hand and to *Plagianthus* on the other. Its inclusion in *Sida* as a section or subgenus, although perhaps theoretically justifiable, would involve the reduction also of *Plagianthus* and allied genera, and would serve no useful purpose. *Plagianthus* differs from *Hoheria* mainly in the shape and texture of the partial fruits, and in the small, more or less unisexual flowers.

Hoheria *A. Cunn.* in Ann. Nat. Hist. iii. 319 (1839); emend. Hook. f. Fl. N.Z. i. 30 (1852).

Arbores vel frutices foliis deciduis. *Carpella* 5–15; stigmata capitata, oblique capitata vel introrse decurrentia. *Fructus proprii* compressi, membranacei, dorso alati vel exalati.

Sect. I. **Euhoheria** *nob.*—*Hoheria* subgen. *Euhoheria* Hook. f. l.c.

Folia argute dentata vel serrata. *Carpella* 5 vel 6–7; stigmata capitata. *Fructus proprii* conspicue alati.

Species: *H. populnea*, *H. sexstylosa*, etc. The section *Euhoheria* is in need of revision, as the status of several of the supposed species is doubtful. This revision, however, could only be done satisfactorily by means of combined ecological and herbarium study.

Sect. II. **Apterocarpa** *nob.*—*Hoheria*, subgen. *Apterocarpa* Hook. f. l.c.

Folia crenata vel crenato-serrata. *Carpella* 10–15; stigmata oblique capitata vel introrse decurrentia. *Fructus proprii* inconspicue alati vel exalati.

Species: *H. Lyallii*, *H. glabrata*. Under International Rules, the name *Apterocarpa* has to be retained, although the group now includes a species with *winged* fruits. Subgenera and sections are of the same "rank," so far as Art. 49 is concerned, hence the treatment of *Apterocarpa* as a section does not warrant changing the name. The two species may be distinguished as follows:—

Folia duplo-vel triplo-inciso-crenata, supra stellato-pubescentia. Stigmata introrse decurrentia. Fructus proprii inconspicue alati .....1. *H. Lyallii*

Folia duplo-crenato-serrata, supra glabrata. Stigmata oblique capitata vel fere capitata. Fructus proprii exalati .....2. *H. glabrata*

1. **Hoheria Lyallii** *Hook.* f. Fl. N.Z. i. 31, t. 11, ram. flor. et fig. 1–4 (1852); A. Gray, Bot. U.S. Expl. Exped. i. 181 (1854), in obs.

Plagianthus Lyallii A. Gray ex Hook. f. Fl. N.Z. ii. 326 (1855), in obs.; Hook. f. Handb. N.Z. Fl. 30 (1864).

Sida Lyallii F. Muell. Veg. Chatham Isl. 11 (1864), quoad syn.

S. Lyallii var. *ribifolia* F. Muell. l.c.

Gaya Lyallii E. G. Baker in Journ. Bot. 1892, 137, quoad syn.

G. Lyallii var. *ribifolia* T. Kirk Stud. Fl. N.Z. 72 (1898); Cockayne in Trans. N.Z. Inst. 1900, xxxiii. 269 (1901); Cheeseman Man. N.Z. Fl., 1135 (1906).

G. ribifolia Cockayne l.c. 272, in obs.; Cockayne Veg. N.Z. 182 (1921) (Engler & Drude, Die Vegetation der Erde, xiv).

Plagianthus ribifolius H. H. Allan in Journ. Ecol. xiv. 78 (1926), in obs.

Arbor, 3–10 m. altus. *Rami* teretes, longitudinaliter rugosi, juventute stellato-pubescentes, demum glabri, cinereo-brunnei, cicatricibus foliorum delapsorum notati. *Folia* ovata, apice breviter acuminata vel acuta tantum, basi cordata vel rotundato-truncata, 3–9 cm. longa, 2–5 cm. lata, chartacea, duplo- vel triplo-inciso-crenata, saepe sublobata, crenis obtusis vel rotundatis, supra stellato-pubescentia vel glabrescentia, subtus praecipue ad nervos dense stellato-pubescentia; petioli graciles, supra canaliculati, stellato-pubescentes, 1–4 cm. longi. *Flores* axillares, fasciculati, 2–3-ni; pedicelli 1–3 cm. longi. *Calyx* cupularis, 5-lobus, 7 mm. longus, extra dense stellato-pubescens, intus glaber; lobi subdeltoidei, acuti, 3 mm. longi. *Petala* 5, breviter unguiculata, obovata, integra, alba. *Stamina* circiter 50; tubus stamineus 7 mm. longus; filamenta propria 3–5 mm. longa. *Carpella* 10–15, pubescentia; stylus in toto 12 mm. longus; pars communis 3 mm. longus; rami 9 mm. longi, longe stellato-pilosi; stigmata introrse decurrentia. *Fructus proprii* dorsaliter alati, ala 1·5–2·5 mm. lata.

South Island of New Zealand. Canterbury, *Lyall* (type); Valley of the Hinds near sources, mountain-sides, 450–600 m., February 1864, *Haast* 96; Awatere, 1860, *Sinclair*; Prov. of Canterbury, 1860–61, *Sinclair* and *Haast* 63; Canterbury Distr. Mt. Torlese, foot of river-terrace, 600 m., March 1901, *A. H. Cockayne in Herb. H. H. Allan* 6480.

2. **Hoheria glabrata** *nob.*, sp. nov.

H. Lyallii var. β Hook. f. Fl. N.Z. i. 31, t. 11, ram. fruct. et fig. 5–6 (1852).

Sida Lyallii F. Muell. Veg. Chatham Isl. 11 (1864), excl. syn.

Plagianthus Lyallii Hook. f. Bot. Mag. t. 5935 (1871): T. Kirk For. Fl. N.Z. t. 134 (1889); H. H. Allan in Journ. Ecol. xiv. 78 (1926).

Gaya Lyallii T. Kirk, Stud. Fl. N.Z. 72 (1898), excl. var. *ribifolia*; Cockayne in Trans. N.Z. Inst. 1900, xxxiii. 271 (1901); Cheeseman, Man. N.Z. Fl. 80 (1906); Cockayne Veg. N.Z. 182 (1921) (Engler & Drude, Die Vegetation der Erde, xiv); Gard. Chron. 1911, ser. 3, l. 56, fig. 27; et l.c. 226, cum ic. suppl.

Arbor, 3–10 m. altus. *Rami* teretes, longitudinaliter rugosi, brunnei, cicatricibus foliorum delapsorum notati, juventute sparse stellato-pubescentes, demum glabri. *Folia* ovata vel lanceolato-ovata, apice acuminata, basi manifeste cordata, 5–12 cm. longa, 2–7 cm. lata, subcoriacea, margine duplo-crenato-serrata, dentibus obtusis vel acutis apiculatis, utrinque glabrata vel rarius sparse stellato-pilosula; petioli graciles, supra canaliculati, 2–7 cm. longi. *Flores* axillares, fasciculati, 2–3 (–5)-ni; pedicelli 2–3 cm. longi. *Calyx* cupularis, 5-lobus, 5–7 mm. longus, extra dense stellato-pubescens, intus glaber; lobi subdeltoidei, acuti, 3–4 mm. longi. *Petala* 5, breviter unguiculata, obovata, integra, alba. *Stamina* 40–45; tubus stamineus 5–7 mm. longus; filamenta propria 4–6 mm. longa. *Carpella* 10–15, pubescentia, 3 mm. longa; stylus in toto 10 mm. longus; pars communis 3 mm. longus; rami 6–7 mm. longi, longe stellato-pilosi; stigmata plus minusve oblique capitata. *Fructus proprii* exalati.

South Island of New Zealand. Milford Sound, *Lyall* (type); Otago, Lake District, often forming a fringe around the Birch forest, fl. Jan. 1863, *Hector and Buchanan* 1; Slope of Mt. Martins, subalpine vegetation, 840–1200 m., March 1866, *Haast* 21; Brabourne near Murchison, margin of forest, by stream, Jan., 1925, *H. H. Allan*; Wairau*, 1860, *Sinclair*; Hurumui†, 900–1200 m., *Travers*.

Travers' specimen from Hurumui has the under surface of the leaves very densely pubescent, differing in this respect from the other material referred by us to *H. glabrata*.

* The only place named "Wairau" which we have been able to find is in Marlborough Province, but this is outside the normal distribution of *H. glabrata*. Sinclair, however, visited this district in 1860.

† Probably identical with Hurunui R. in Amuri Distr., Canterbury Prov.

Postscript.—After the foregoing account had gone to press a paper by Dr. H. H. Allan entitled "Epharmonic response in certain New Zealand species, and its bearing on taxonomic questions" appeared in the Journal of Ecology, vol. xiv. pp. 72–91 (1926). In this he deals shortly (p. 78) with *Hoheria Lyallii* (as *Plagianthus ribifolius*) and *H. glabrata* (as *P. Lyallii*) as follows :—

"The distribution of the species is remarkable: *P. Lyallii* is apparently confined to regions of the South Island exposed to the great western rainfall; *P. ribifolius* occurs in the eastern mountain region, beyond the limit of western rainfall. Cockayne says (Trans. N.Z. Inst., 1900, xxxiii. 272), 'It is ecologically of extreme interest that a character seemingly so trivial as a slight variation in hairiness of leaf has led to these two species not having inter-mingled, although they approach in places to within only three or four miles from one another at the most; and it shows, moreover, how an apparently unimportant character may govern the climatic distribution of a plant. It may also be pointed out that both forms thrive equally well side by side in lowland gardens where the rainfall is slight, and the characters of each, so far as I have been able to ascertain, remain unchanged.'

"Now *P. ribifolius* is a plentiful plant on Mt. Peel, forming groves at elevations above the general forest line, and descending as occasional plants into the forest of the upper plains. The forest is true rainforest, and the environment perfectly suited to *P. Lyallii*, but it does not occur. In dense shade by the sides of streams the Mt. Peel plant, elsewhere typical *ribifolius*, becomes a shrub the leaves of which are almost identical with those of *P. Lyallii*, being much more acuminate, and having the pubescence practically confined to the veins. Rarely one finds specimens showing both forms of foliage. It would seem that research is required to determine whether we are not, after all, dealing with a species sufficiently plastic to adapt itself to the very different conditions of habitat in which the two forms grow. It may be that we have here an example of an epharmonic variation that has become fixed, or almost so, but the question as to the taxonomic status of the two forms seem still open."

As has been pointed out above (p. 218), the differences between the two species are not confined to the leaves, additional diagnostic characters being afforded by the stigmas and fruits. These latter differences do not seem to afford any support to Dr. Allan's suggestion that in the case of *H. Lyallii* and *H. glabrata* we are dealing with epharmonic variations of a single species. The problem, however, is one which can only be solved in the field.

XXIX.—MISCELLANEOUS NOTES.

Retirement of Mr. John Masters Hillier.—On March 31st last Mr. J. M. Hillier retired from the post of Keeper of the Museums of the Royal Botanic Gardens, Kew, under the age limit. Mr. Hillier came to the Royal Gardens from the Kew Observatory in

1879, and for twenty-two years was assistant to Mr. J. R. Jackson, then Keeper of the Museums. In 1892 he was placed on the permanent establishment as an Assistant and, when Mr. Jackson retired, in 1901, Mr. Hillier was appointed Keeper.

During the forty-seven years Mr. Hillier has been at the Museums the collections have increased continuously and, despite the extension of Museum No. III and the addition of Museum No. IV during that period, the buildings have proved quite inadequate to accommodate suitably the material which has now been assembled. This increase has been due not only to the presentations that normally occur but also to the considerable acquisitions from the Imperial and International Exhibitions that have taken place since Mr. Hillier assumed charge of the Museums.

Mr. Hillier has served under four Directors and for the last year of his service has held the record of longest service on the staff of the Royal Botanic Gardens.

In succession to Mr. Hillier the Minister of Agriculture and Fisheries has appointed Mr. W. D. DALLIMORE to be Keeper. Mr. Dallimore has been a member of the Kew Staff since 1891 and an Assistant in the Museums since 1908.

The following appointment has been made by the Secretary of State for the Colonies:—Mr. R. V. D. WHITE, to be a Produce Inspector, Nigeria.

The Rottler Herbarium.—Some time prior to 1872 Mr. (now Sir) William Thiselton-Dyer and Mr. Trimen, while working on the herbarium of King's College, London, brought to light Dr. Rottler's herbarium collected in Southern India between 1798 and 1805. This had been stored in a special large table-press but left unmounted, and had not been used for a considerable period. How the collection came to King's College has not been ascertained, but it is thought that it had been obtained by Professor Henfrey, who was Professor of Botany at King's College from 1853 to 1859.

In 1872, when Sir Joseph Hooker invited his help in the preparation of the Flora of British India, Mr. Thiselton-Dyer brought this herbarium to Sir Joseph's notice and indicated its value for the purpose of the flora as it contained several type specimens with original holograph descriptions. At Sir Joseph's request the Council of King's College generously agreed to transfer the collection and 1,918 specimens were received and incorporated in the Kew Herbarium.

In 1924 Professor R. R. Gates, Professor of Botany at King's College, mentioned in the Annual Report of the Delegacy of the College that he had discovered further specimens of Rottler's which had become separated and left behind when the bulk of the collection was transferred to Kew in 1872. Sir William Thiselton-Dyer called the attention of the Director to this report, and on his application to the Council of King's College they agreed that the intention of the

Council in 1872 was to transfer the whole of the Rottler Herbarium to Kew. In consequence the residue of the collection, amounting to some 200 specimens, has been received and incorporated in the Kew Herbarium.

Plants from the Pyrenees.—The Rev. E. Ellman has kindly contributed a further collection of 290 Herbarium specimens, collected in the Pyrenees (*K.B.* 1925, p. 41). Mr. Ellman kindly invited Mr. N. Y. Sandwith, one of the temporary botanists at present engaged on the work of the Herbarium Store, to accompany him on his travels on the French side of the Eastern Pyrenees, last June. The collecting began with a week in the hot Tet Valley region (alt. 1,500–3,500 ft.) round Vernet and Villefranche, the flora of which combines Pyrenean with Mediterranean elements, and possesses a number of local species which, at least in France, are largely confined to the Pyrénées Orientales. The ground was well worked a century ago by Bentham and by Endress, who gathered many of the Villefranche plants in his 'unio itinerario.' The more noteworthy finds included *Dianthus serratus* Lapeyr., *Buffonia perennis* Pourr., *Lathyrus cirrosus* Ser., *Galium maritimum* L., *Kentranthus angustifolius* DC., f. *Lecoqii* Jord., *Achillea chamaemelifolia* Pourr., *Campanula speciosa* Pourr., *Antirrhinum Asarina* L., *Scrophularia alpestris* Gay, *Teucrium aureum* Schreb., *Lamium flexuosum* Ten., *Paronychia serpyllifolia* DC., *Rumex Acetosa* L., 'race' *papillaris* Boiss., *Thymelaea dioica* All., *Orchis coriophora* L., subsp. *Martrini* Timb.-Lag., and *Dipcadi serotinum* Medic.

The following week was spent at a much higher altitude (5-9,000 ft.) at Mont Louis, where *Gentiana pyrenaica* was seen in perfection; and the remaining three days in the Ariege Valley between the Col de Puymorens (where the road rises to 6,000 ft. near the borders of Andorra), L'Hospitalet and Ax-les-thermes. The more unusual plants in this district and at Mont Louis were *Draba nemorosa* L., *Oxytropis Lazica* Rouy, f. *Foucaudi* (Gill.) Rouy, *Lathyrus luteus* Peterm., subsp. *hispanicus* Rouy, *Saxifraga geranioides* L., *S. mixta* Lapeyr., *Eryngium Bourgati* Gouan, *Angelica Razulii* Gouan, *Erigeron frigidus* Boiss., *Carduus carlinoides* Gouan, *Willemetia apargioides* Cass., *Pedicularis mixta* Gren., with *P. pyrenaica* Gay, *Plantago monosperma* Pourr., *Scilla Lilio-Hyacinthus* L., *Gagea Soleirolii* F. Schultz, and *Luzula glabrata* Desv., var. *Desvauxii* (Kunth) Buch.

University of Sydney.—We learn with interest of the official opening of the new buildings of the Botany School, of the University of Sydney, on the 6th of November, 1925. The present School of Botany was created in 1913, and the Chair of Botany, established in the previous year, was filled by the appointment of Dr. A. Anstruther Lawson to the post of University Professor of Botany. During the years 1913–1916 classes were conducted in the Fisher Library, the Medical School and the Geology Department. These

arrangements proved inadequate and inconvenient, and temporary additional quarters were provided in 1916 in part of the Macleay Museum.

A fine new stone building was completed last year which provides adequate accommodation for the Botany School. The style is a modern version of perpendicular Gothic, in harmony with the main University Building and Great Hall, with which latter it forms two sides of a turfed garth. This garth is being laid out in a formal manner in keeping with the main approach to the University, and utilising such features as a lawn, a playing fountain and a small Botanic Garden. On the eastern facade the purpose of the building is indicated by the names of Robert Brown, Darwin, Mendel, and Hofmeister, inscribed on heraldic shields, supported by grotesques terminating the main buttresses.

The new building, the orientation of which has been especially designed to meet the requirements of botanical study and research, contains the following:

1. The Bentham and Hooker Botanical Museum, which will contain the teaching collection of museum specimens and living plants.
2. The John Ray Herbarium, fitted with cabinets for the preservation of some 10,000 herbarium specimens of Australian plants.
3. The Darwin Laboratory, with accommodation for thirty advanced students, equipped for advanced teaching and for training in methods of research.
4. The Robert Brown Research Laboratory, for students in their fourth year.
5. The Joseph Banks Laboratory, seating 135 students, for the training of First Year students in Science, Arts, Medicine, Agriculture and Pharmacy.
6. The Library and Reading Room.
7. Several smaller research rooms for members of the staff and for research students.
8. A Lecture Theatre, capable of seating 200 students for first year lectures in Botany.
9. The Physiological Laboratory.

The number of students from the various faculties attending classes in Botany during the last decade is given as 3,153, a yearly average of 315 students.

The opening ceremony was performed by the Vice-Chancellor, after which a short address was given by the Professor of Botany, Professor Anstruther Lawson. Exhibits were arranged in the new Laboratories and Museum.

Balata.—The Report of the Department of Science and Agriculture, British Guiana, for 1924 records some interesting statistics on the growth of the tree (*Mimusops bidentata* DC.), from which Balata is obtained (*K.B.* 1911, p. 198). The records are from trees planted for experimental purposes at Issorora. The mean rate of growth

has been slow, the average annual girth increments being 1·85 inches, the maximum 2·62 inches and the minimum 1·17 inches. The minimum girth at which trees are allowed to be tapped in the Colony is 36 inches measured at a height of 4 feet 6 inches, and it is estimated that the trees of the experimental crop will on the whole take 30 years to attain this size. About half of them may be of the required size when 20 years old, others when only 14 years. It is considered, therefore, that plantations of Balata trees will require 15 years after planting out before tapping can be begun.

Smoke.—This extremely interesting book* contains a summary of many years' work on atmospheric pollution in all its aspects. Most of the original research has been conducted at Leeds, where the daily soot-fall is estimated at 1 ton per square mile per day. It is pointed out that soot is not pure carbon but contains many other substances, noteworthy amongst which are tar and acids (especially sulphurous and sulphuric). Soot from the glass roofs of Kew and Chelsea gardens contained nearly 5% of SO_3. Since domestic soot has a larger percentage of tar and consequently a greater adhesive property than that derived from industrial concerns, the damage to buildings and vegetation is probably mainly due to the domestic fire-place. Vegetation is very sensitive to a polluted atmosphere and conifers appear to be most sensitive of all plants. The tar products block up stomata and form a film reducing the available sunlight, while the acids have a corrosive effect. Experiments with radishes, lettuces, spring cabbages, and wallflowers, grown in localities with different degrees of air pollution, very clearly showed the effects of such on plant growth. Soil itself is changed, the acids neutralizing the calcium carbonate. This reduces the fertility by retarding the necessary ammonical fermentation of the soil humus, and even more by lowering the activity of the nitrifying and nitrogen-fixing organisms in the soil. It was also shown by experiments with timothy grass that the continued application to the soil of acid rain produces a grass distinctly poorer in protein and richer in fibre, and consequently less nutritious, than when pure or neutralized water was used. The presence of smoke contamination is usually made manifest by an increased sulphur content in the leaves of trees and plants. Details are given on the plant and general vegetation as an index of smoke pollution, on the formation, constitution and influence of fog, and on the effect of smoke on buildings and health.—

W. B. T.

A New Hybrid Conifer.—*Kew Bulletin* 1926, p.114, line 42, for 21 cm. read 21 mm.

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* Smoke, a study of town air, by J. B. Cohen and A. G. Ruston. London: Edward Arnold & Co. 1925. New enlarged edition, pp. vii and 108, pl. 14. Price 8*s*. 6*d*.

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